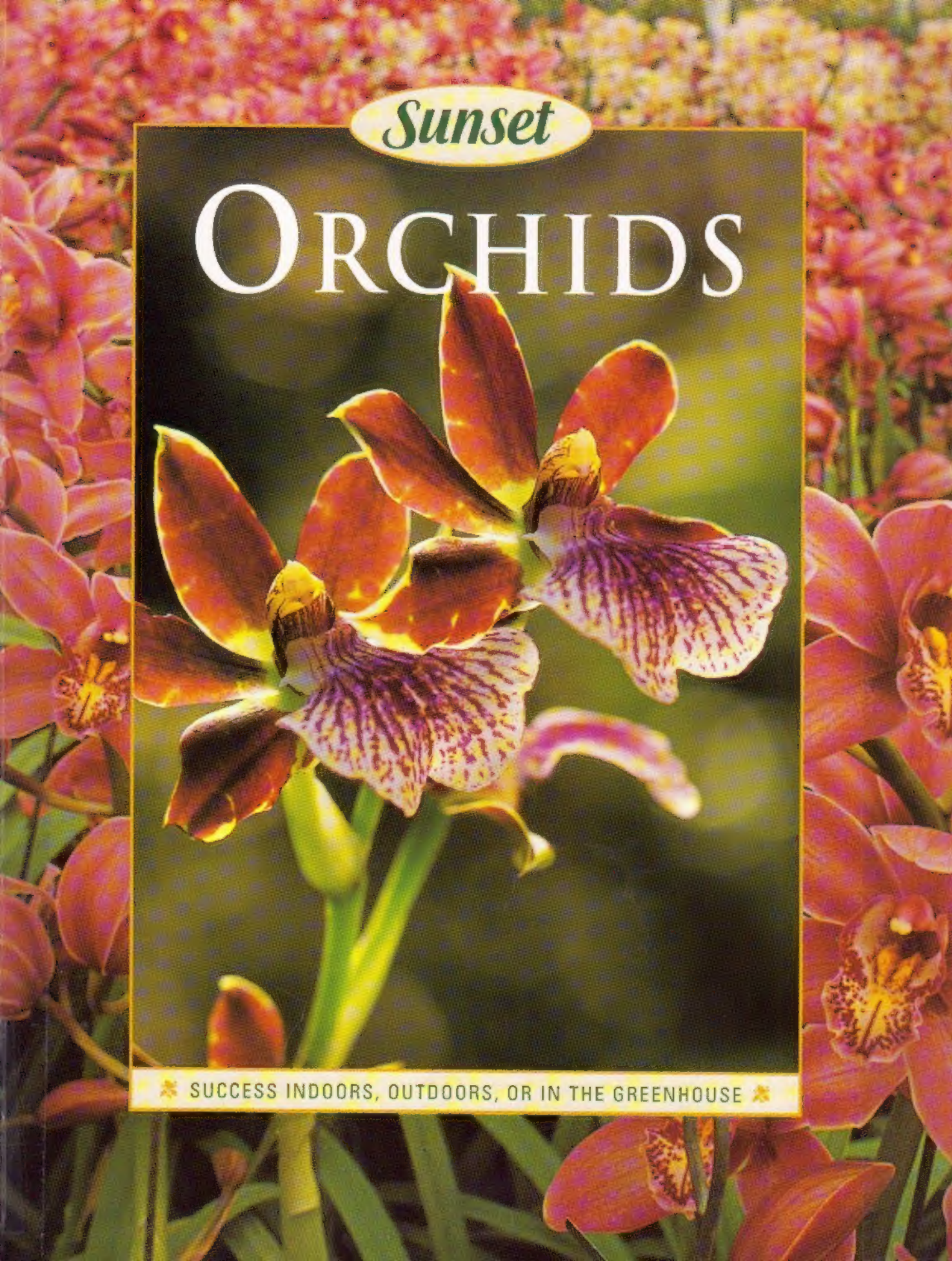
Sunset

ORCHIDS



SUCCESS INDOORS, OUTDOORS, OR IN THE GREENHOUSE

Sunset

ORCHIDS

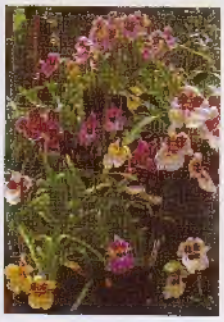
BY JOHN R. DUNMIRE AND THE EDITORS OF SUNSET BOOKS

SUNSET BOOKS • MENLO PARK, CALIFORNIA

Contents

UNDERSTANDING ORCHIDS 5

What Is an Orchid? • Where They Grow • A Brief History • Understanding Orchid Names • American Orchid Society Awards



GROWING HEALTHY ORCHIDS 17

Temperature and Humidity • Light and Air • Water • Fertilizer • Hydroponics • Troubleshooting Problems

ADDING TO YOUR COLLECTION 29

Growing Your Own • Dividing Orchids • Raising Seedlings from Flasks • Potting Techniques • Miniature Orchids • Shopping for Orchids

GREENHOUSE AND OUTDOOR CARE 43

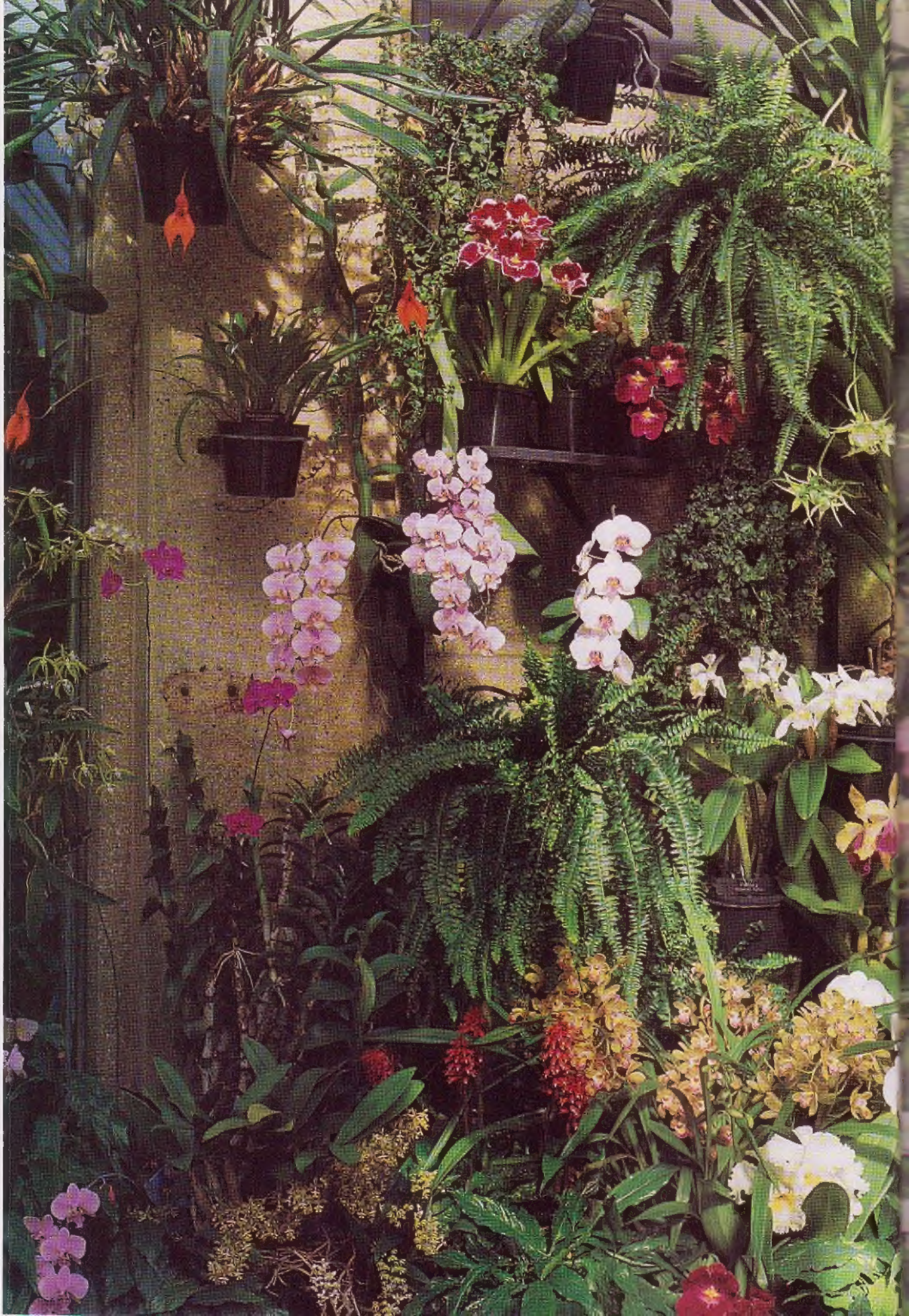
Orchids Under Glass • Orchid Beauty Outdoors • Orchids for Near-Tropical Regions • Orchids for Temperate Regions • Hardy Orchids • A Note on Conservation

A GALAXY OF STAR PERFORMERS 53

How Orchids Are Classified • The Cattleya Alliance • Cymbidiums • The Vanda Alliance • The Dendrobium Alliance • The Oncidium Alliance • The Slipper Orchids • The Botanicals

GLOSSARY 109

INDEX 112



UNDERSTANDING ORCHIDS

Orchids have been called the aristocrats of flowers, but perhaps it would be better to liken them to queens. After all, queens outrank mere aristocrats—and we may truly say of the orchid, as Shakespeare did of Queen Cleopatra, that "age cannot wither her, nor custom stale her infinite variety." Once admired mainly in prom or opening-night corsages and as exotic displays in conservatories or botanical gardens, the orchid has now descended from her throne and is to be found in florist shops, nurseries, and even on the racks of discount stores and supermarkets. Orchid societies hold shows and sales in shopping malls, county fairgrounds, and many other venues, where it is possible to find a blooming plant for no more than you would pay for an azalea. Familiarity in this case, however, breeds not contempt but attempt, as new converts discover how surprisingly easy it is to grow orchids.

The most familiar orchids are phalaenopsis, cattleyas, cymbidiums, and paphiopedilums (lady's slipper orchids), but other kinds—notably dendrobiums, miltonias, and masdevallias—are gaining in popularity. In addition, there are countless others to lend variety to a collection.

The orchids spilling down the wall of this conservatory represent only a tiny fraction of the thousands of members of the orchid family.

A burst of color, called a splash pattern, is seen here on × *Laeliocattleya* 'Ontario' HCC/AOS. The colors of multihued orchids should be clear and well defined.

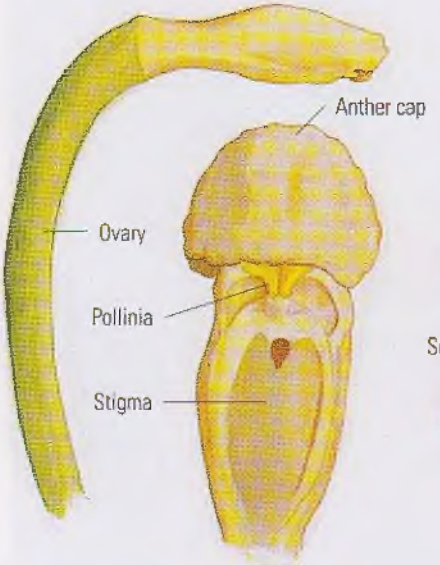
WHAT IS AN ORCHID?

The thousands of species of orchids make up an exceedingly varied family. Many orchids are so different in appearance that it's hard to believe they are related. Even given their amazing variety of sizes, shapes, and proportion of parts, orchids do have a number of mutual characteristics that distinguish them from other plants.

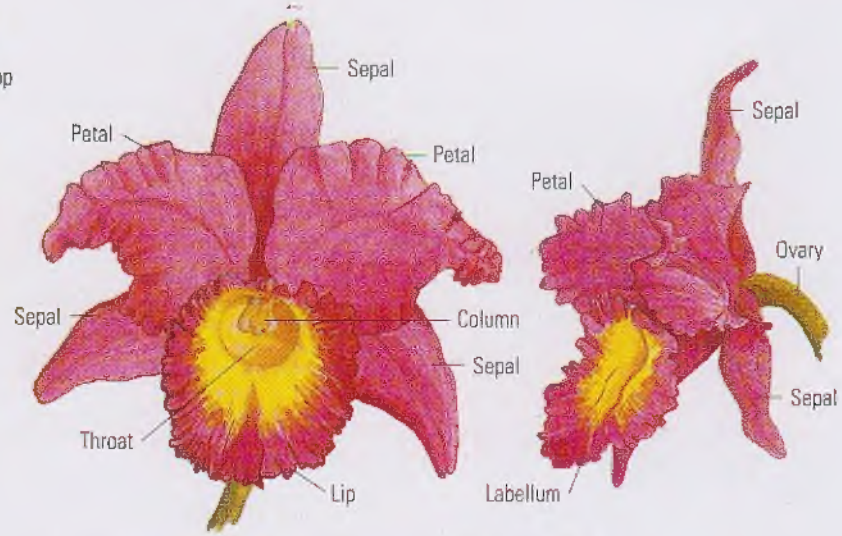
Botanically speaking, orchids are perennial plants with *zygomorphic*, or irregular, flowers (that is, they can be divided into two equal halves in only one plane—unlike, say, a rose or camellia flower, which can be divided in any of many planes). Flowers typically consist of three outer segments *(sepals)* and three inner segments *(petals)*, one of which is greatly modified in form and called the *labellum*, or lip.

The reproductive parts of the flower are concentrated in an organ known as the *column* (see the illustration below, left). The purpose of the many highly complex structures involving the lip and column is to ensure that the pollenizing agents (bees, flies, beetles, birds) will transfer pollen from one flower to another of the same species, preventing either self-pollination or cross-species pollination.

Many modifications of the flower structure occur: the lip may be enormously enlarged or reduced, the petals may be so reduced as to become nearly invisible, and



The column contains the stigma, which receives the pollen, and the anther cap, which holds it. Orchid pollen is clustered in compact masses called pollinia.



An orchid's flower has many parts: the petals, the sepals, the labellum or lip, the throat, and the column, which is sometimes hidden by the folds of lip. The ovary, or seed-bearing organ, is just below the flower and resembles a flower stalk.

A close-up look at a cattleya hybrid clearly shows the column and its parts.

one or more of the floral parts may be fused or drawn out into long tails. These irregularities and the complex structure of the orchid flower give it a strange beauty—and, not surprisingly, other strangely beautiful flowers are often mistaken for orchids.

Orchid flowers come in all colors except true black (and *Coelogyne pandurata* has markings that approach true black), but the predominant colors are pink, lavender, red, yellow, and white. True blue is rare and much esteemed; brown and green are quite common, and many species have flowers marked with two or more contrasting colors. The highly fragrant zygopetalums commonly have green-and-brown sepals and petals, with a white lip marked in purple.

Flowers vary in size from nearly a foot across to mere pinheads. Many have fragrances ranging from fresh and fruity to sultry and exotic. (A few, it must be admitted, smell like carrion; these are not commonly grown!)

Orchids' growth habits are nearly as varied as their flowers. Many grow on trees (*epiphytes*) or rocks (*lithophytes*), surviving on rain and the nutrients brought them by decaying leaves and other organic detritus. None is a parasite; orchids may live on a tree, but they take no nourishment from it.

Others (*terrestrials*) live in the soil and may have fibrous roots, rhizomes, or tubers. A few (though not in cultivation) have no chlorophyll and live as *saprophytes* on decaying plant matter in the soil. Some familiar orchids are opportunists, sometimes living in pockets of leaf mold on rocks or in the crotches of trees, sometimes flourishing on the ground in rich, highly organic soil.

Orchid flowers vary greatly. Above, a cattleya (TOP), masdevallia (CENTER), and paphiopedilum (BOTTOM) display their differences.

TWO TYPES OF GROWTH

Orchid plants increase their size in one of two ways. Those with *monopodial* growth (see the illustration below, left) become taller each year as a consequence of new growth forming only at the tip of the stem. Leaves are set in two rows on opposite sides of the stem, each one alternating with its partner. Flower spikes and aerial roots originate in a leaf joint or opposite a leaf. The stems may become tall, as in many species of *Vanda,* or may be so short as to be practically invisible, as in species of *Phalaenopsis.* Note that if these orchids' top growth becomes damaged, they may still produce new growth from dormant buds lower on the stem.

The second growth type, by far the more prevalent, is *sympodial* (see the illustration below, right). Here the upward growth of the plant stops, in most cases, after one season; the next year's growth arises from the base of the prior year's, extending the plant laterally (or vertically, if the plant is growing on a vertical surface). Sympodial orchids may bloom from the tips of the most recent growth, from its base, or from buds on older growths.

Many sympodial orchids develop thickened stems called *pseudobulbs;* these store water and food, enabling the plant to survive periods of drought. Pseudobulbs may be round and fat, flattened, or elongated into cylindrical stems usually called canes. They vary from microscopic to many feet in length. Leaves may grow either along the pseudobulbs or from their tips.

In monopodial growth, the central stem lengthens from a single point at the top of prior growth; aerial roots and flower stalks all originate from that same central stem. Vandas and phalaenopsis are good examples of monopodial growth.

Sympodial growth is typical of the majority of orchids. New growth arises from the base of the prior year's growth; it matures in one season, producing first flowers and then more new growth. Cattleyas and dendrobiums exemplify sympodial growth.

WHERE THEY GROW

A few terrestrial orchids grow north of the Arctic Circle, but many more grow in the temperate regions of Europe, Asia, and North America. A large number of terrestrials grow where the climate is "Mediterranean"—South Africa, the Mediterranean basin, Chile, and parts of Australia. Most of these tend to grow and bloom in winter and spring, resting during the dry months as tubers.

In cold-winter regions terrestrials overwinter as dormant tubers or rhizomes, and then grow, bloom, and set seed in spring and summer. In such areas of North America they are considered difficult to grow and are rarely seen as garden plants. However, a few species are available from mail-order sources, and their use is likely to grow slowly as more is learned about their cultural needs.

Epiphytic orchids are found chiefly in subtropical and tropical regions (although one, *Epidendrum conopseum*, grows as far north as North Carolina, and several Asiatic species range northward to Japan). Although often thought of as jungle plants, they are seldom found in dark, dank undergrowth. Most live on trees high above ground where light is plentiful, or on rocky ledges in clearings and at forest's edge. Many live where rainfall is seasonal, so have evolved mechanisms to conserve moisture.

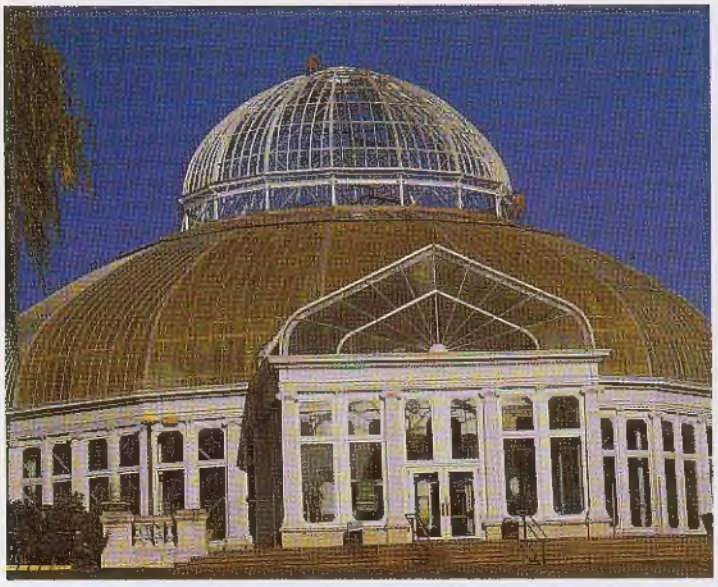
Exotic epiphytes fill this courtyard garden turned mini–rain forest. Jacaranda trees supply support for the plants, create a junglelike canopy, and provide the space to grow far more plants than a standard arrangement of pots on a horizontal surface.

Africa and Australia have large numbers of epiphytes, but the tropical Americas, southeastern Asia, and the islands of Indonesia have many more. In all of these regions orchids grow from sea level to the timberline, from steaming coastal forests and seasonally dry scrub woodlands to perpetually moist mist forests at the higher altitudes. Probably the highest concentrations flourish in the mountains of New Guinea and in the misty mountains of Costa Rica, Colombia, Ecuador, and Peru. Obviously, one set of growing conditions will not suit all species.

Epiphytes and lithophytes have had to adapt to receiving irregular supplies of food and drink. Many of these are orchids with pseudobulbs (see page 8). Most also have thick and fleshy leaves, whose waxy surfaces evolved to retard the transpiration of water. Some drop their leaves during rest periods and await rains to resume growth.

The roots of epiphytic orchids are also well adapted for gathering and preserving moisture, being thick, little branched, and covered by a velvety or spongy layer known as the *velamen*. This layer is made up of many cells that when dry are filled with air, but that readily take up moisture from rain or atmospheric humidity and retain it for a long time.

In addition to extracting water and nutrients, the roots of epiphytic orchids can anchor the plants on their perches. These roots have the ability to fasten onto any available support, insinuating themselves into the crevices of tree bark or clinging tightly to porous ceramic pots.



Conservatories became popular locations for orchid collections. The Como Park Conservatory in St. Paul, Minnesota, here receiving finishing touches to its restoration, was built in 1913. The worker on the dome gives an idea of its scale.

A BRIEF HISTORY

The earliest known orchids, terrestrials in the Mediterranean region, were named *Orchis*—an earthy reference to the Greek word for testicle, because of their twin oval tubers. These and other orchids from time to time have been considered useful in medicine, but the only orchid of true economic value (excepting those grown for flowers) is *Vanilla planifolia*, the source of vanilla flavoring. It was used by the Aztecs and thus became known to Europe shortly after the Spanish conquest of Mexico.

Epiphytic orchids from the West Indies and China were brought to Great Britain beginning in the 1700s; by the end of that century 15 species were growing at the Royal Botanic Gardens at Kew. Success was indifferent, however, because the plants were grown in hot, damp greenhouses with little or no air circulation.

As growing techniques improved, shortly before the middle of the 19th century, orchid growing became a craze among the wealthy and titled. Collectors canvased the tropics for new or choice orchids, sending back plants by the ton. So indefatigable were they that in many areas desirable orchids became rare or even extinct. Many plants perished in transit, still more at the unskilled hands of buyers. Prized specimens sold for enormous prices, giving rise to the perception of the orchid as a "rich man's plant." Such reckless exploitation was finally halted by a treaty known as CITES (Convention on International Trade in Endangered Species of Wild Flora and Fauna). Under its terms, international trade in endangered plants and animals has been strictly controlled.

An even greater danger, however, has been habitat destruction. The clearing of forests to harvest lumber or to create agricultural or pasture lands has seriously diminished the world's orchid population. Fires purposely set to clear land can reduce large areas to a semidesert condition; for example, they may well have obliterated many Indonesian orchid species. Fortunately, one comparatively recent development has benefited both the economies of orchid-rich but cash-poor countries and the preservation of their native species. In many countries, native orchids are now being grown in nurseries for export, for local sale, and to restock natural habitats.

Another contribution to the increased availability of orchids has been the crossing of native species. Hybridization began in the 1850s, when it became evident that orchids that rarely crossed in the wild could be induced to do so by the horticulturist. Indeed, many crosses between genera were made; the current list of hybrids far surpasses 100,000 and continues to grow with each year.

Difficulties in propagating, nonetheless, kept orchids scarce and expensive for some time. Propagation by seed was slow and chancy, so division was the only means of ensuring the increase of choice plants. Orchids remained a plaything of the wealthy until the discovery of seed germination in a sterile nutrient medium made raising seedlings practical on a mass scale. Later, tissue culture in similar media made possible the replication of selected choice specimens (see page 30).

Getting Started with Orchids

Orchid raising is a hobby that you can pursue as far as your means and time will allow. With more than 25,000 species and 100,000 hybrids, the orchid family is one of the largest in the plant kingdom, so you are not likely to run out of subjects. Still, you can be contented with a few plants on a windowsill, happy with an artificial light setup in the basement, and happier yet with a sheltered lanai, Florida room, or greenhouse to host a wider selection.

Chances are that your first orchid will be a plant you purchase at a florist's shop, an orchid show and sale, or an orchid grower's establishment. Another strong possibility is that you will be offered a plant by an orchid loving friend who wishes to proselytize you. You may even be seduced by an orchid in a supermarket or nursery; these are increasingly important outlets.

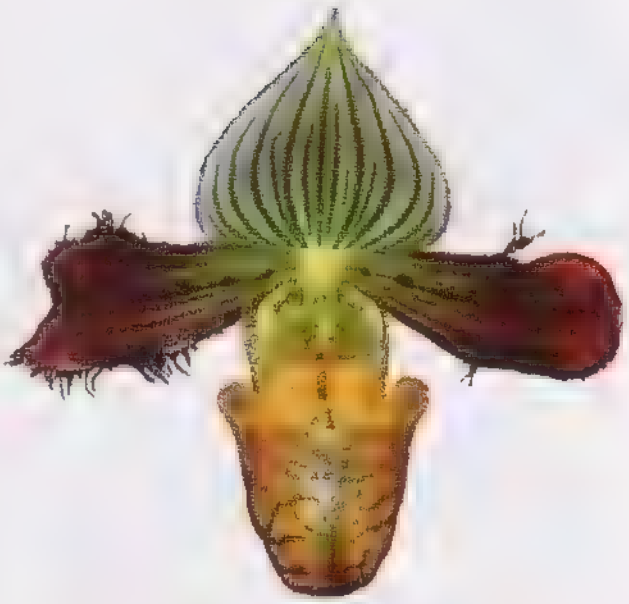
Once you start growing orchids, your next move might be to join the American Orchid Society. This group publishes *Orchids,* a handsomely illustrated monthly magazine with a wealth of articles on orchids and their culture. Its advertisements are good sources for obtaining plants and supplies, and its bulletin boards list shows, sales, and other special events. Each year the magazine issues an almanac with the names and addresses of local affiliated groups, lists of orchid judges, meeting schedules, orchid sites on the World Wide Web, and a growers' directory of more than 300 nurseries and mail-order resources. The society's address is 6000 South Olive Avenue, West Palm Beach, FL 33405-4199.

Understanding Orchid Names

Regardless of the origin of your first orchid, be sure to discover its name and supply it with a label if it lacks one. Your supplier (if an orchid specialist) should be able to identify your plant. If you buy your first venture in a supermarket or a general nursery, it will probably be a moth orchid *(Phalaenopsis)* or a lady's slipper orchid *(Paphiopedilum);* both are good choices, because they are tolerant of the low light found in most residential rooms. They are also the only two orchids commonly called by English names. From here on in your orchid adventures, it's all Latin!

As your collection grows you'll find that your recollection diminishes. You'll appreciate it later if you develop an early habit of marking your acquisitions. Labels should be written with waterproof, sunproof ink or a common lead pencil on white plastic, impressed on soft metal strips, or punched out on tape by an embossing labeler. (If your purchase has no name, you may be able to determine it later from an expert at an orchid show or sale.)

Continued on page 14>



This gorgeous and accommodating orchid with a striped lip is *Paphiopedilum venustum*

A good choice for a beginner and a handsome addition to any collection, this is × *Laeliocattleya jongbeana* 'Kristin' CCM/AOS

Deciphering Your Orchid's Heritage

Orchid names can be confusing to a new convert, but a look at this chart, in conjunction with the explanations here and on page 14, will help you understand just why your orchid is called by a specific name—and will also encourage you to discover and record the heritage of other orchids you may acquire.

Keep in mind that only a small portion of the orchid family is shown in the chart on the facing page; at the genus and species levels, only a few examples are given to help you envision how the system works. Nonetheless, the levels and logic are the same for all other orchids.

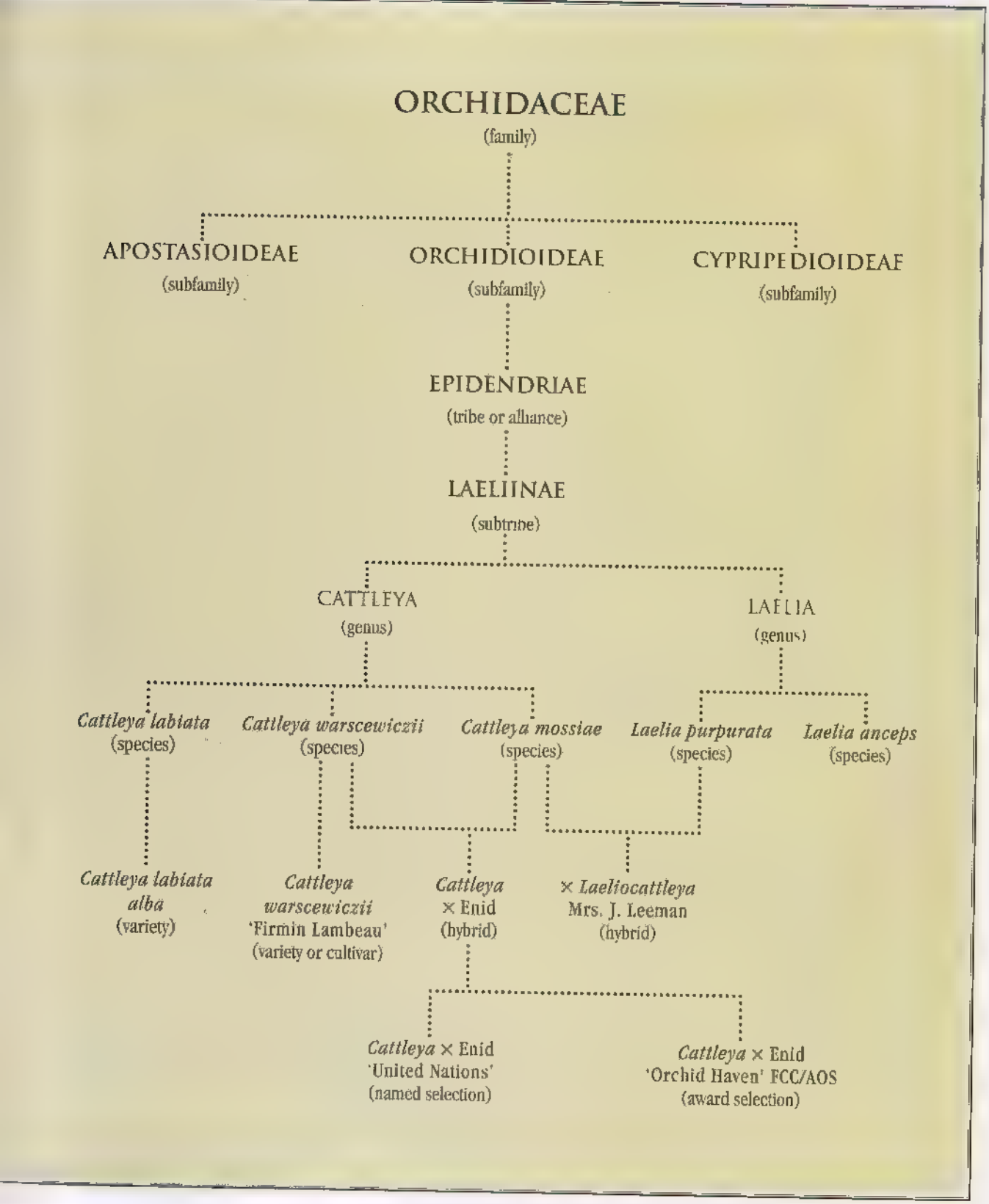
Every orchid belongs, ultimately, to the immense Orchidaceae family, which is divided into subfamilies. The subfamilies in turn are divided into tribes, or alliances, which may also contain subtribes. Finally, within each tribe or subtribe, you'll discover the familiar genus, which is the "first name" of your orchid.

Each genus contains numerous naturally occurring species, but things become really interesting when orchids are crossbred between species, to produce hybrids such as *Cattleya* × Enid. And just to add to the mix, orchids can also be crossed between genera, resulting in intergeneric hybrids such as × *Laeliocattleya* Mrs. J. Leeman

TOP LEFT *Laelia anceps veitchiana* 'Fort Caro...ne' HCC/AOS
ABOVE *Cattleya* Golden Sands 'E...zabeth Straus'
LEFT *Laelia anceps* 'Rustic Royalty' HCC/AOS

Finally, exceptionally beautiful or unusual hybrids are given a variety or cultivar name enclosed in single quotation marks, and any awards that orchid has received are included as part of it's name.

It sounds complex, and it is—but once you've attended an orchid show or perused a mail-order catalog, you'll find that an orderly logic, agreed on and adhered to by all growers, does indeed reign in the world of orchid nomenclature

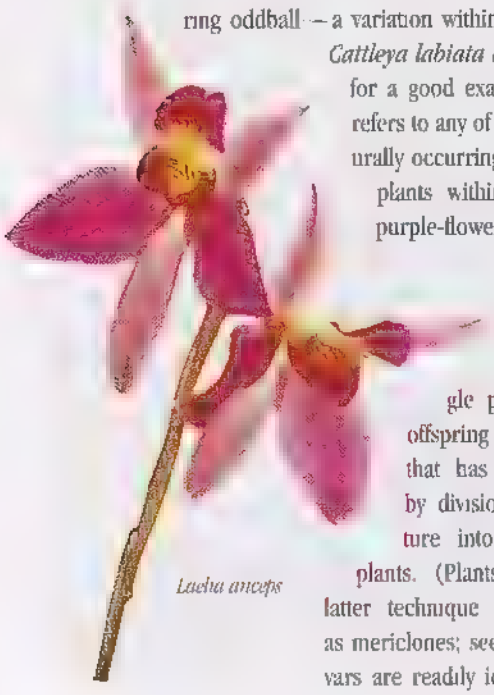

ORCHIDACEAE
(family)
APOSTASIOIDEAE
(subfamily)
ORCHIDIOIDEAE
(subfamily)
CYPRIPEDIOIDEAE
(subfamily)
EPIDENDRIAE
(tribe or alliance)
LAELIINAE
(subtribe)
CATTLEYA
(genus)
LAELIA
(genus)
Cattleya labiata
(species)
Cattleya warscewiczii
(species)
Cattleya mossiae
(species)
Laelia purpurata
(species)
Laelia anceps
(species)
Cattleya labiata alba
(variety)
Cattleya warscewiczii 'Firmin Lambeau'
(variety or cultivar)
Cattleya × Enid
(hybrid)
× Laeliocattleya Mrs. J. Leeman
(hybrid)
Cattleya × Enid 'United Nations'
(named selection)
Cattleya × Enid 'Orchid Haven' FCC/AOS
(award selection)

Names are important because they are keys to plant relationships as well as to plant quality. Knowing the name is also the key to finding out your plant's needs. The chart on page 13 will help demystify the intricacies of the name game. Only one of several classifications that have been devised, the scheme on which that simplified chart is based will no doubt undergo further revision at the tribe and subtribe level. In the words of Gerard's *Herbal* (1597), "But we will leave controversies to the further consideration of such as love to dance in quagmires."

In the scheme shown in our chart, the subfamily at left, Apostasioideae, is of little importance; some botanists even exclude it from the orchid family. The Cypripedioideae subfamily contains the slipper orchids, many of which are widely grown. The subfamily at the center, Orchidioideae, contains the vast majority of cultivated orchids.

The subfamilies are divided into tribes and subtribes, which in turn are divided into genera. Each separate genus contains from one to many species that show a close relationship to each other. The genera *Laelia* and *Cattleya*, for instance, share traits that place them in the same tribe. Similarly, *Laelia anceps* and *L. purpurata*, though distinct species, are enough alike to be included in the same genus.

Stepping down to the next level on the family tree, note that although the terms *variety* and *cultivar* are sometimes used interchangeably, there is a subtle difference. When you see the word *variety* (or, more commonly, the abbreviation *var.*) in an orchid name, it means you have a naturally occurring oddball—a variation within a species. Find *Cattleya labiata alba* in the chart for a good example; this name refers to any of a number of naturally occurring white-flowering plants within the ordinarily purple-flowering species.



Laelia anceps

A cultivar, on the other hand, is in essence a single plant (or all the offspring from that plant) that has been replicated by division or tissue culture into many identical plants. (Plants grown by the latter technique are also known as mericlones; see page 30.) Cultivars are readily identifiable by the single quotation marks around a name; any such plant that you purchase is guaranteed to be identical to its named or awarded original.

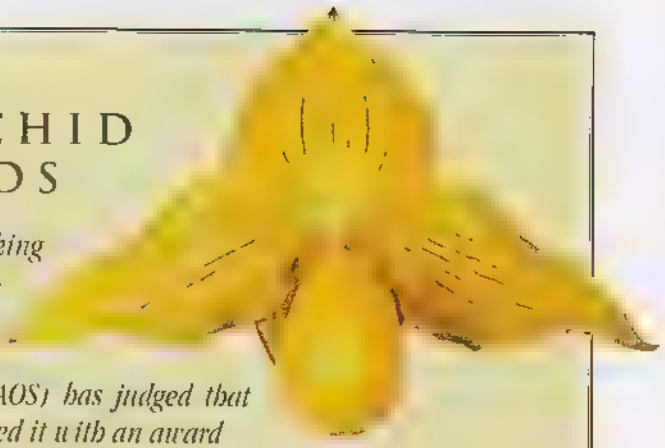
When two orchid species are crossed and the offspring made to bloom, the hybridizer gives that cross a name that all seedlings are entitled (and obliged) to bear, regardless of who else might make that cross or how many years later it might be made. For example, all hybrids of *Cattleya mossiae* and *C. warscewiczii* are called *Cattleya* × Enid. The symbol × indicates that the plant so named is a hybrid. (Don't expect to see this symbol in orchid catalogs; it is a botanist's, not a grower's, term.) You will also encounter the term *grex;* this word, taken from the Latin for flock, denotes all the offspring of a cross between two species. Keep in mind that, because plants from the same parents (or even individual plants within a species) will all differ from each other to some extent, the hybrid name is not a guarantee of quality, as with cultivars, but only of ancestry.

Really fine hybrid orchids or select individuals within a species can be further designated in two ways. The hybrid name may be followed by a selection or cultivar name enclosed in single quotation marks (for example, *Cattleya* × Enid 'United Nations' or *C. warscewiczii* 'Firmin Lambeau'). If an especially fine plant has received an award, the award initials following the name may also designate this superior plant, as in *Cattleya* × Enid 'Orchid Haven' FCC/AOS. (Awards are discussed on the facing page.) The award designation becomes a part of that orchid's name.

But wait; there's more! Members of different orchid genera, too, can be crossed freely. Plants of these intergeneric hybrids bear names that indicate their parentage: × *Laeliocattleya*, for example, denotes a cross between a laelia species and a cattleya species. Sometimes three or more genera are involved. In such instances the name may reflect the parent genera (× *Brassolaeliocattleya*, from *Brassia* × *Laelia* × *Cattleya*), or it may be a coined name established to indicate hybrid origin. These coined or code names end in *-ara* and are usually preceded by the name of the hybridizer. × *Potinara*, for instance, includes hybrids involving *Rhyncholaelia (Brassavola)*, *Cattleya*, *Laelia*, and *Sophronitis*. Other examples are × *Maclellanara* and × *Bealleara*.

Notice that scientific, or Latin, names are displayed in italics; this convention is always followed in scientific works, but not necessarily in magazines or catalogs. These distinctions may not mean much to you now, when you're eager to turn the page and learn the basics of orchid care—but as your collection grows, you'll want to refer back to this section to see just how your beauties are related.

American Orchid Society Awards



While shopping in an orchid nursery or looking through a catalog, you'll often notice an abbreviation—FCC/AOS, for example—at the end of a variety's name. What does the abbreviation mean? It means the American Orchid Society (AOS) has judged that plant to be an outstanding orchid and has presented it with an award.

The AOS regularly grants these awards to exceptional plants or flowers. The society's certified judges conduct award sessions at regional conferences, regional monthly judging sessions, and annual shows. Many of the orchids pictured in this book are AOS award winners.

If you understand the criteria that AOS judges use to evaluate orchids, you'll better appreciate the orchids you see, those you want, and those you already have. This knowledge will also be useful if you decide to submit your own orchids for judging.

When considering individual flowers of new varieties, the judges evaluate form (or shape), color, size, and substance (thickness or waxiness). A round, full flower is one trait of an award winner (flatness, too, is a goal for miltonias, phalaenopsis, and vanda flowers).

Colors must be clear and definite. Multihued orchids' colors should appear in well-defined areas and patterns, and any blending of colors should be regular and harmonious, not muddy.

The new orchid's size should be an improvement over the average size of its parents. The flower's substance, too, must exceed that of the parents—a very heavy substance is the accepted ideal for some types.

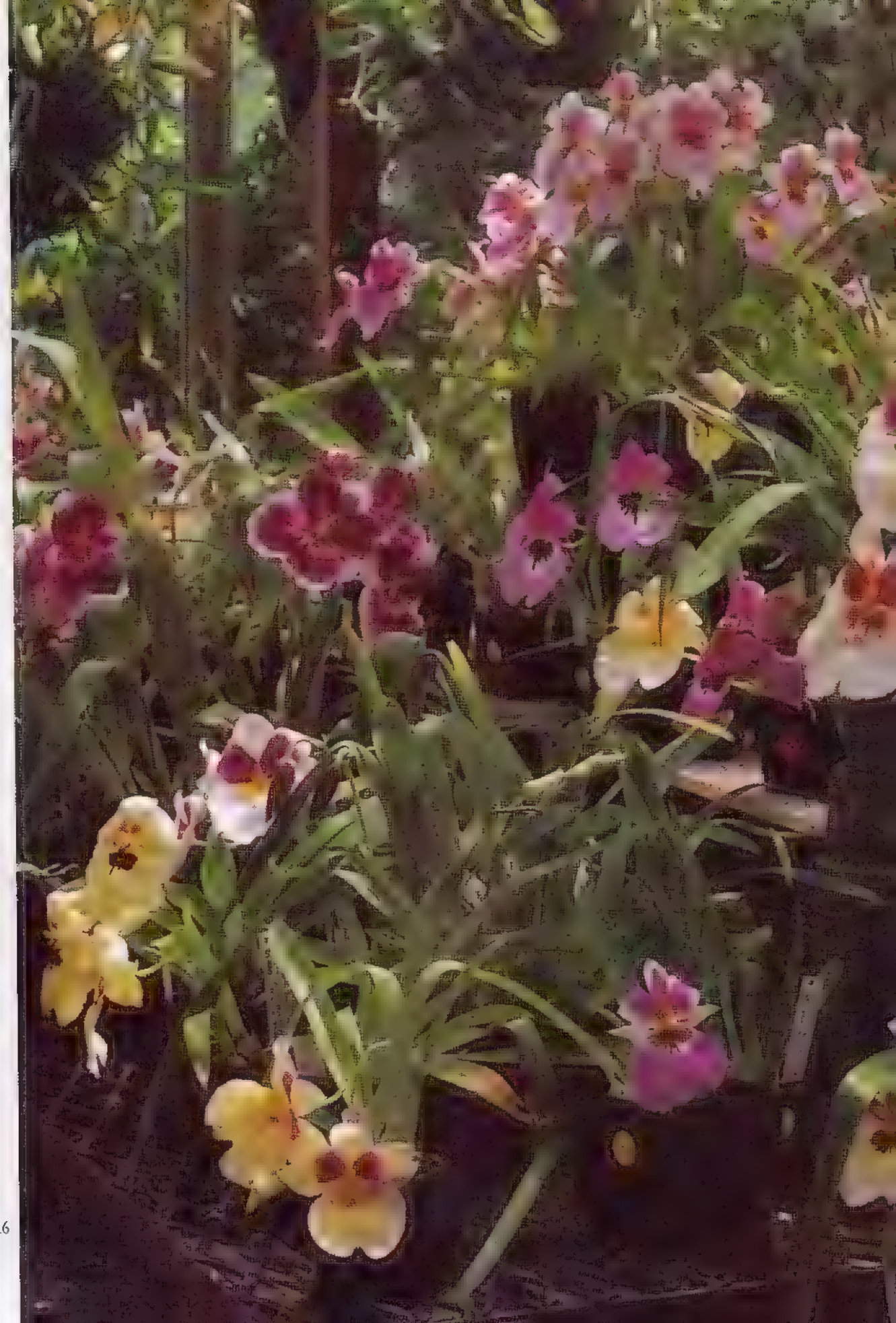
An orchid deemed perfect in every respect could receive a score of 100 on the judges' point scale, though this has never occurred. For any imperfections, points are deducted. An orchid receiving 90 points or more receives a First Class Certificate (FCC), the top honor awarded by the AOS. The orchid pictured above, *Paphiopedilum* × Dollgold 'Oso Grande,' was such a winner, as was the × *Brassolaeliocattleya* Port of Paradise 'Emerald Isle' on page 58.

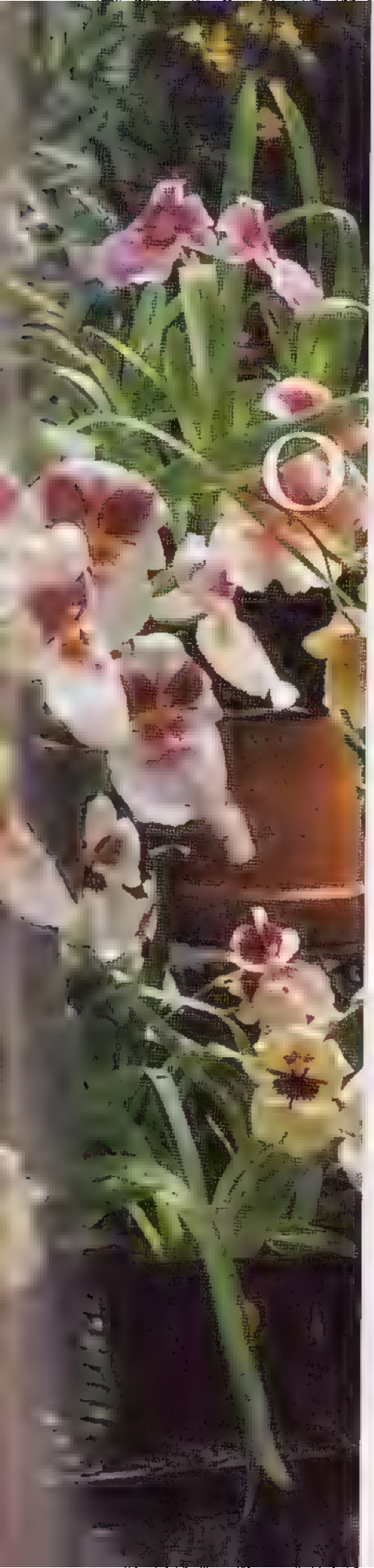
A score of between 80 and 89 points earns an orchid the Award of Merit (AM). Some of the AM/AOS winners shown in this book are the *Cattleya loddigesii coerulea* 'Blue Sky' on page 57, the *Laelia tenebrosa* 'Binot' on page 62, the × *Ascocenda* 50th State Beauty 'Mauvine' on page 72, the *Phragmipedium* × Grande 'The Wizard' and the *Phragmipedium besseae* 'Laurie Susan Weltz' on page 93, the *Vasdevallia* Proud Prince 'Royalty' on page 104, and the *Sobralia macrantha* 'Voodoo Priestess' on page 107.

Orchids scoring between 76 and 79 points earn a Highly Commended Certificate (HCC); this is the commendation most frequently given. Examples of recipients are the × *Laeliocattleya* 'Ontario' on page 6, the *Sophronitis coccinea* 'Vermilion Fire' on page 63, the *Odontoglossum* 'Castle de Lux' 'Blackberry' on page 82, the *Rossioglossum grande* 'Chestnut Clown' on page 86, and the × *Burrageara* 'Living Fire' 'Rustic Red' on page 87.

Another major award of the society is the Certificate of Cultural Merit (CCM), which is given to well-grown plants—those of good size, in prime condition, with an unusually large number of quality flowers. Because these orchids need not be outstanding new hybrids or varieties, even a beginning orchid grower can earn this award. Some examples are the × *Laeliocattleya* Canhamiana 'Mauvine Gloaming' on page 59, the *Dendrobium speciosum* 'Clay' on page 78, and the *Anguloa clowesii* 'Ruth' on page 95.

Although the immediate purpose of judging is to recognize these exceptional orchids, the American Orchid Society also grants awards to encourage worthwhile trends in hybridizing, you'll often see designations for these awards as well. The result? Better and more beautiful orchids for all of us.





GROWING HEALTHY ORCHIDS

Despite their delicate and exotic appearance and reputation, most orchids are tough, durable plants with a strong will to survive. This means that even relatively unskilled gardeners can keep an orchid alive. To go further—to make your orchid thrive and bloom—simply requires adherence to a few general rules and the exercise of your own common sense.

The most important factor in orchid culture is close attention to the plants; their appearance and behavior will indicate whether they are thriving. If they are not, it is up to you to recognize warning signals from your plants and remedy any deficiency. Some general rules regarding temperature, humidity, light, air circulation, and water apply to all orchids. To learn more about the needs of individual orchids, see the descriptions given in the encyclopedia listings beginning on page 53.

Advanced amateurs are likely to pursue their hobby in a greenhouse, but many orchid fanciers from every state in the Union and in every province in Canada are happily growing orchids indoors, either at a window or under artificial light.

Orchids thrive when their basic needs are met—a surprisingly easy end to achieve, if you pay attention and learn each species' likes and dislikes. These *Miltoniopsis*, for example, prefer cool temperatures.

Light through a generous window enhances a growing environment. Here, a southeastern exposure has proved just right, and leaving the windows slightly ajar allows good air circulation and prevents overheating.

Temperature and Humidity

Broadly speaking, orchids enjoy the same temperatures that we do—70° to 80°F (21° to 27°C) during the day, with a drop of 10° to 15°F (5° to 9°C) at night. As you study catalogs and talk to growers you will encounter the terms *warm-growing*, *cool-growing*, and *intermediate*. These all refer to a species' minimum winter nighttime temperatures—that is, the coldest conditions it will tolerate.

Cool-growing orchids, for instance, thrive in nighttime temperatures of 50° to 55°F (10° to 13°C), rising to 60° to 75°F (16° to 24°C) during the daytime. This group includes cymbidiums, odontoglossums, masdevallias, and many paphiopedilums. Some cool growers tolerate night temperatures into the low 30s (−1° to 2°C); predictably, these plants can be difficult to grow where summer temperatures are consistently high. Still, even in this group some individual species tolerate higher temperatures.

Intermediate temperatures—55° to 60°F (13° to 16°C) at night, 65° to 80°F (18° to 27°C) during the day—are satisfactory for cattleyas, dendrobiums, many oncidiums, paphiopedilums, and a large number of the so-called botanical or species orchids (see page 94). Warm growers such as vandas, phalaenopsis, and some tropical paphiopedilums appreciate nighttime temperatures of 60° to 65°F (16° to 18°C) and daytime temperatures of 70° to 85°F (21° to 27°C).

If temperatures are too high for more than a brief period, orchid plants will suffer. If bright sunlight accompanies high heat, leaves will show sunburn—bleached areas that turn brown or black. Depending on the amount of damage, the leaves may fall off or (in extreme cases) the plant may die. High heat and strong light also encourage plants to transpire, or lose moisture through their leaves, to their detriment. Even if they do not look sunburned or otherwise stressed, plants will not thrive in excessive temperatures—they will assume a yellowish tint and fail to grow or bloom.

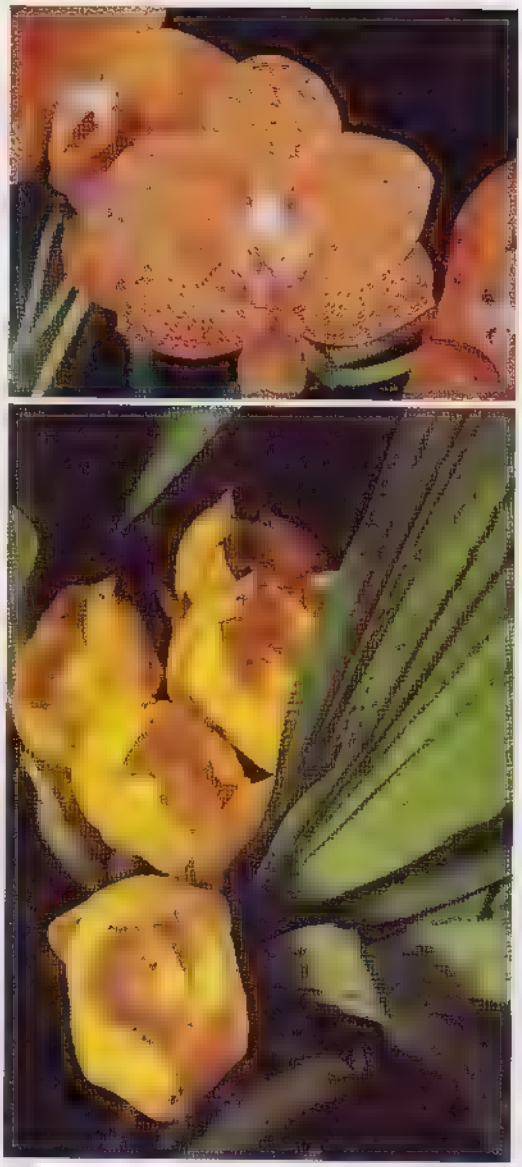
Higher summer temperatures will not harm most orchids, however, if they are sheltered from hot sun and given increased humidity as temperatures rise. Daytime temperatures to 90°F (32°C) are actually beneficial, especially for the warm growers. Many hobbyists move their orchids outdoors for the summer, where dappled shade and moving air can reproduce the conditions they enjoy in their native forests.

Atmospheric humidity—the amount of moisture in the air—is as important as temperature to orchid health. Although most orchids grow naturally in humid environments, indoors they can make do with a humidity level of 30 to 40 percent—which fortunately is comfortable for most people as well. Lower humidity levels, like strong light and high heat, will increase their transpiration rate. To measure your atmospheric humidity, ask in hardware stores for a hygrometer.

If the humidity level is inadequate you can raise it with a portable electric humidifier, by adding a humidifier unit to your central-heating forced-air furnace, or by keeping a kettle gently steaming on the stove. As temperatures rise indoors, the humidity level should be increased in compensation. As temperatures drop in the evening so should the humidity level, in order to thwart the disease organisms that thrive in the combination of low temperatures and high humidity.

Many people maintain adequate humidity for their orchids by placing their pots on trays filled with gravel and water. Evaporation from the wet gravel keeps the air around the plants fresh and moist. Be careful not to let water in the tray rise to pot level, however; stagnant water around orchid roots will cause them to rot. Growing a number of plants close together also helps maintain humidity, because each plant's transpired moisture is shared with its neighbor.

If the indoor environment is dry, spraying your orchid plants with a fine mist of water is another way to supplement atmospheric humidity. Spray bottles of the type used for cleaning windows are easy to come by. The mist should be fine enough to leave a thin, quickly evaporating film on the leaves; a coarser spray can cause problems by drenching plant, pot, and planting mix. Spray early enough in the day so that the leaf surfaces and plant crowns can dry out before evening. This is especially important when humidifying phalaenopsis (moth orchids).



Phalaenopsis Cauldron 'Orange Hi C/AOS (TOP) is a warm grower, whereas *Anguloa clowesii* (BOTTOM) prefers cool temperatures.

LIGHT AND AIR

Light is another critical factor in growing and inducing orchid plants to bloom. In fact, lack of adequate light is the chief reason for an orchid's failure to bloom. On the other hand, too much of a good thing is a problem, as well—for instance, when it results in sunburn. And although some species require full sunlight, others need restricted light to perform well. Keep in mind that in nature, orchids seldom grow either in extremes of light or where air is stagnant. Fortunately, you can supply your indoor plants with appropriate light and ventilation, by both natural and artificial means, to keep them healthy and induce them to bloom.

NATURAL LIGHT. In your home, the amount of light a plant receives can be controlled by its placement in a window. Large east or south windows are preferred, but west-facing windows will do very well if strong afternoon light is softened with thin curtains. Bay windows can be excellent locations, and skylights and solariums greatly expand the indoor area that is well lit enough for growing orchids. Experiment: sometimes moving a plant just an inch or two—into more or less sun than it had been receiving—can mean the difference between thriving and simply existing.

On very cold winter days, move plants away from the glass somewhat. At the slightest hint of sunburn interpose a thin curtain, or move the plant back from the window or to another location where the light is not so strong. Plants that develop dark green foliage and fail to bloom may need to be moved to a brighter window.

Modern windowsills are seldom wide enough to hold any but the very smallest plants; however, wider ledges can be added to the sills or narrow tables drawn up under windows to provide "foot room" for the plants. Orchids should not be so tall as to look out of scale with the window; 30 inches is sometimes cited as the maximum height for a window plant. You will have no difficulty finding many this size or smaller. In fact, many so-called miniatures (see page 37) are less than a foot tall; two or three shelves suspended in a window may hold a dozen or more.

Greenhouse windows available as add-on structures to the house are a tempting way to gain additional space for plants, but keep in mind that the light in such windows is stronger than in conventional ones. Extra-careful attention to shading and ventilation will be needed for your orchids to prosper there.

ARTIFICIAL LIGHT. Many indoor gardeners rely on artificial lighting to replicate the conditions that their orchids need to grow and bloom. Shade-loving species, especially, often prosper under lights, and some commercial sources grow all of their plants that way.

The challenges inherent in setting up an artificial system are reproducing the full spectrum of color found in sunlight and avoiding excessive heat. Fluorescent lights were long favored for their relative coolness, which allows them to be placed quite close to plants. On the other hand, no fluorescent light supplies the entire color range necessary for both photosynthesis and bloom. A typical arrangement therefore has combined cool-white fluorescent lamps, which furnish the blue-green end and some of the orange-red end of the spectrum, with incandescents or warm white fluorescents, which provide far red light. (Newer, wide-spectrum fluorescent lamps can furnish 95 percent of the daylight spectrum.)

Some home growers build their own setups in a basement, attic, or other little-used space. An overhead rack might contain just fluorescent bulbs or a combination of fluorescent and incandescent bulbs. (Those less mechanically inclined can purchase racks fully equipped with shelves, fiberglass trays, lamp fixtures, lamps, and even wheels for mobility.) Orchids that like high light may be grown as close as 3 inches below the lamps. Others needing less light, such as paphiopedilums, phalaenopsis, and masdevallias, may be placed 8 to 12 inches beneath them.

HOW TO MEASURE LIGHT INTENSITY

Light intensity is measured by a unit known as the foot-candle—the amount of light cast by a candle on 1 square foot of surface. Low light is considered to be 1,000 to 1,800 foot-candles, which is equivalent to 2 hours of filtered sunlight a day. In low light conditions, a hand passed over the plant will not cast a shadow. Intermediate light, between 1,800 and 4,000 foot-candles, is equivalent to broken sunlight; your hand will cast a soft shadow on the plant. High light is considered to be 4,000 to 5,000 foot-candles, the equivalent of roughly half the strength of noonday sun; your hand will cast a sharp shadow on the plant. (Authorities disagree about exact numbers.)

When growing orchids under lights, you can duplicate natural-light conditions by adjusting the number of hours per day of light you provide and the distance you place the plants from the light source. If you are using fluorescent tubes, low light is considered equivalent to 14 hours of light daily within a distance of 8 inches from the tubes, medium light to 16 hours within 6 inches, and high light to 16 hours within 3 inches. More than 16 hours per day is actually harmful, as it can prevent flowering. If you are using other artificial light sources, you will need to adjust these times and distances somewhat; experimentation and experience will be your best guide.

If you have the equipment, there's a simple way to calculate the foot-candles of any location where you want to grow orchids. Place a sheet of plain white paper or cardboard at a 45° angle where your plant is to grow and take a reading of it with a hand-held photographic light meter.

If you don't have a light meter, a 35-mm camera with manual controls and through-the-lens metering will work. Set up the sheet of paper, then set the camera film speed at ASA 25 and the exposure at 1/60 second. Without throwing a shadow on the paper, line it up through the camera's viewfinder and take a reading by adjusting the f-stop until the needle is centered. Then convert that number to foot-candles using the following guide.

f-stop	5.6	8	11	16
foot-candles	750	1,500	2,800	5,000

Making Your Own Corsages

You needn't be a florist to produce attractive professional-looking orchid corsages. With minimal supplies and as few as a dozen of your own orchid plants, selected for consecutive seasons of bloom, you can turn out corsages almost year-round.

Because of their long-lasting qualities, orchids make superior corsage flowers. The flowers are so lovely that cutting them from the plant will take courage at first, but as your collection grows the temptation to use your own flowers for special occasions and gifts will win out.

So that the flower will have developed its full color, cut it only after it has been open on the plant for a few days. Using a sterile razor, sever the flower stem from the stalk. Then, 1 to 1½ inches down from the flower base, recut the stem at an angle to enable it to take up water more readily.

Insert florists' wire (sold in most crafts shops) crosswise through the stem, close to the flower's base. Bend the wire down along each side of the stem and twist a second wire around both stem and wire, in a spiral. Using green florists' tape, securely wrap the stem and the first few inches of wire that extend beyond it; bend this extension upward. For a muluflower corsage, you can tape together several wired flowers in a pleasing arrangement. When attaching the corsage, try to pin through the tape rather than piercing the stems.

In corsages of single flowers the orchid should be worn lip side down —that is, the way it naturally grows. In multiflower corsages, at least one orchid—preferably the dominant one—should be in its natural position

Ribbon bows can be effective complements to orchid blooms, but use them sparingly to avoid detracting from the flowers. When pinning a beribboned corsage to clothing, secure the pin through the ribbon, not through the stem.

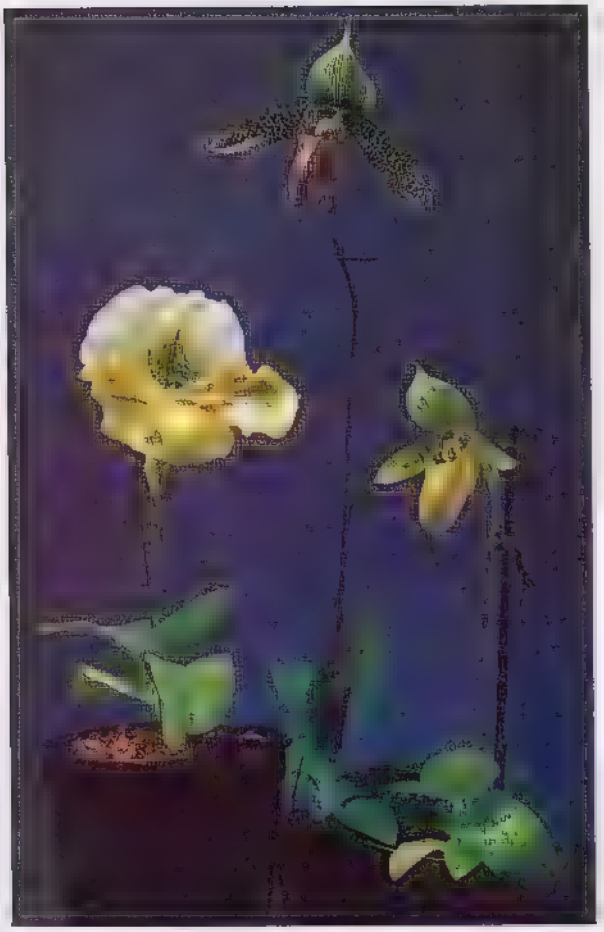
To keep an orchid fresh for a prolonged period of wearing, the stem can be inserted in a vial of water. Tiny glass vials for this purpose (available from florist suppliers) have a rubber cap with a hole through which you insert the unwrapped stem for its entire length. If you cannot locate the vials, you can encase the stem in moist cotton before wrapping it in plastic and disguising it with florists' tape.

Until the corsage is worn, keep it in a refrigerator where the temperature will not be lower than 45°F (7°C)—for example, in the vegetable compartment. (Stems can be left in the glass vial or moistened cotton.) Placed on a bed of shredded wax paper in a closed plastic bag, orchid flowers will remain fresh for many days

You can eas..y fashion th.s gift to surprise anc. delight fam ly and friends

In other arrangements, the Wonderlite, an incandescent 160-watt floodlight, provides wide-spectrum light and can be positioned 3 to 6 feet above the plants. HID (high-intensity discharge) lights rated at 400 watts can be effective up to 5 feet above the plants. These are of two types: HPS (high-pressure sodium) has higher levels of the yellow, orange, and red light that boosts flowering, and is useful in the greenhouse. MH (metal halide) sheds full-spectrum, natural-looking light; it is the better choice for the home.

Most orchids thrive on 14 hours of artificial light per day throughout the year, though some need more, some less, experiment and observation are your best guides. Artificial lighting for plant growth is a complex subject; check with your local bookstores or the American Orchid Society Book Shop (see page 11) for full treatments of this topic.



Paphiopedilums with mottled green leaves (LEFT) tolerate cool temperatures, those with molded leaves (RIGHT) prefer warmer conditions.

VENTILATION Free air circulation is another requirement of healthy orchids, in part because stagnant air tends to trap heat around their leaf surfaces. Home ventilation is generally satisfactory during the summer, because some windows are almost always open. In climates that require summer air-conditioning, or that prohibit keeping a window ajar in the winter, you'll need a small oscillating fan to keep air moving and help in modifying your growing conditions. Do not direct the fan at the plants, as they will not tolerate drafts; instead, position it so that the flow of air is directed above or below your orchids. If a forced-air heating or air-conditioning duct is located beneath a window where plants are growing, cover it with a deflector to direct air into the room and away from the plants.

In most climates your orchids will benefit by spending the summer out-of-doors, under light shade. The fresh, moving air and humidity are to their liking, as are the occasional cleansing rains. However, low night temperatures in the high mountains and high daytime temperatures combined with low humidity in the desert Southwest rule out summer "vacations" in locations such as these

WATER

There is no single rule to tell you how often to water your orchids; most will need it once or twice a week, but that need depends on many interacting factors. A knowledge of those factors will allow you to determine the particular requirements of your plants and to make adjustments as conditions change.

Container size and type will determine the relative frequency of waterings needed, regardless of other conditions. Orchids in large pots (from 8 to 12 inches) dry out slowly; plants dry out more rapidly as the container size decreases. All potting media dry out faster in clay pots than plastic pots. Baskets and rafts or slabs require water more often than do containers with solid sides.

The type of potting medium also affects your plants' water requirements; for example, coarse fir bark dries more rapidly than does finer osmunda fiber. However, note that even when a coarse medium's surface is dry, the root area may remain moist. An easy way to determine whether a plant needs water is to poke your finger an inch into

the mix; if it feels cool or moist, don't water. After you have become more familiar with your plants, you will learn to judge their moisture needs by their weight. A light plant is dry and needs water; a heavy one can wait.

The level of artificial heat indoors, too, influences your orchids' demands for water: the higher and more constant your heat, the more water they will need. Even the weather outdoors exerts an influence. On cloudy days plants cannot use up much water, because their transpiration rate is low. Conversely, on hot, sunny days they will need abundant water to replenish moisture lost through transpiration.

Here's a convenient rule of thumb: when in doubt, don't water. Remember that most orchids have their own water reservoirs in their thickened roots and leaves, so a few days without moisture will not be harmful. When watering your plants, always use tepid water—about 50° to 70°F (10° to 21°C). Cold water can actually be harmful to phalaenopsis. Other guidelines to remember are that plants in stages of active growth need more water than do resting plants, and those summering out-of-doors will need additional water to compensate for the quicker evaporation caused by breezes.

The quality of the water you give your orchids is important as well. In nature, epiphytes and lithophytes receive all their moisture in the form of rain, so most will eventually suffer or die if their irrigation water is heavily laden with mineral salts. Water passed through sodium-exchange water softeners (the kind that use salt) is especially damaging and should never be used on orchids: the process substitutes sodium for calcium, and sodium can quickly destroy orchids (and other plants, for that matter). The calcium in hard water, on the other hand, can cause lime deposits on leaves and pots, so it, too, can stunt or kill plants (except for paphiopedilums, which actually benefit from it). If your collection is small, bottled water is an option: read the label or ask your supplier for a chemical analysis.

The ideal water is rainwater, and where rain is predictable many growers go to great lengths to save it. Where public water is poor, orchid enthusiasts who don't save rainwater may remove harmful minerals from their water supply by using ion exchangers or reverse-osmosis water purifiers. (Most large water districts can furnish a chemical analysis of your water.) Where water quality is good and chlorination is the only problem, fill your watering can and let it sit overnight; the chlorine will evaporate.

Fertilizer

In the wild, epiphytic orchids take their nourishment from whatever comes their way in the form of falling leaves trapped around their roots, bird droppings, or nutrients dissolved in rainwater. Under these conditions their growth is slow. In cultivation they grow faster and bloom sooner if fed with fertilizers containing three basic elements—nitrogen (N), phosphorus (P), and potassium (K)—along with trace elements such as iron.

Because the coarse mixes used for most orchids drain quickly and retain little water or fertilizer, feeding must be frequent. Most orchid growers use soluble fertilizers, which are designed to be diluted with water and applied to the planting mix. Never use dry lawn or garden fertilizer; its strong concentration could destroy your plant's roots.

One common planting medium, bark, requires more nitrogen; fertilizers formulated for bark therefore follow a 3-1-1 ratio, in which the proportion of nitrogen is three times that of phosphorus and potash. Examples would be 30-10-10 or 18-6-6 formulas. The high-nitrogen formula not only furnishes enough nourishment for the plant but also satis-

HYDROPONIC ORCHID GROWING

Hydroponics is the science of growing plants in a nutrient solution. Long used for vegetable production, the technique has recently been adopted for raising orchids as well. One arrangement houses a plant in a sterile growing medium (clay aggregate) inside an ornamental double-walled pot. Water and nutrients bathe the roots in the inner pot, and an indicator shows the liquid level. The pot is relatively expensive, but the manufacturer points out that the plant needs no misting, no humidity tray, and no replacement of the growing medium. A more elaborate device is a waterproof planter containing a tank of nutrient solution. A pump automatically empties the tank into the orchid pots, and then recovers the solution for recycling. A possible drawback of this technique is that a single diseased plant can infect all others sharing the nutrient solution.

fies the needs of the microorganisms that might otherwise consume much of the nitrogen as they slowly break down the bark.

A 1-1-1 formula contains equal parts of the basic elements and is used for orchids growing in media other than bark, or on rafts and slabs. Many orchid fanciers use a single 1-1-1 formula with success for all their orchid plants.

A third type, often referred to as a high-bloom formula, has a 1-3-2 ratio. The high phosphorus content stimulates flowering, so these fertilizers are used when growth is complete and flower bud production is anticipated.

The rule when applying liquid fertilizers to orchids is to do so lightly and frequently;

PEST PROBLEMS

In general, orchids are remarkably free of pests. If you do notice a problem, take care of it early to minimize its spread to other plants in your collection.